

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Rhodes trustees have decided to add 200*l.* a year for the next five years to the stipend of the reader in pathology. Mr. Alfred Beit and Mr. Wernher have supplied sufficient money to endow a professorship of colonial history, and to appoint an assistant professor in the same subject. They have also made a gift to the Bodleian Library.

Magdalen College has made a grant to the delegates of the university museum of 250*l.* a year for the next two years for the purpose of the payment of scientific assistants.

The following examiners have been appointed:—in chemistry, W. H. Perkin, jun.; in preliminary physics, E. S. Craig; in preliminary chemistry, J. E. Marsh; in preliminary animal physiology, W. Ramsden; in preliminary zoology, E. S. Goodrich; in medicine, organic chemistry, N. V. Sidgwick; in human anatomy, A. Thomson; in materia medica, R. Stockman; in midwifery, J. S. Fairbairn; in pathology, G. Sims-Woodhead; in forensic medicine and public health, J. D. Mann and A. L. Ormerod; and in human physiology, L. E. Hill.

THE Treasury, at the instance of the Colonial Office, has made a grant of 500*l.* a year to the Liverpool School of Tropical Medicine.

THE prizes and certificates gained by students at the Sir John Cass Technical Institute during the past session will be distributed by Sir William H. White, K.C.B., F.R.S., on Thursday, December 1. The laboratories and workshops of the institute will be on view, and there will be exhibitions of students' work.

At Bedford College for Women two occasional lectures, open to the public without fee, will be delivered on November 25 and December 8. The first lecture will be by Prof. Karl Pearson, F.R.S., on "Recent Work and some Unsolved Problems in Heredity," and the second by Miss C. A. Raisin on "London, its Early Foundation and Later Growth, a Geological Study."

THE alumni of the Massachusetts Institute of Technology are collecting, says *Science*, a fund for current expenses, which now amounts to more than 20,000*l.*, to be used in the course of the next five years. We learn from the same source that Harvard University has received from Miss Whitney a gift of 1000*l.*, the income of which is to be applied as a scholarship to aid meritorious students in the study of field geology or geography in the summer months, preferably in the mountain region of the western United States.

APPLICATION will be made to Parliament in the ensuing session for an Act to transfer University College, London, exclusive of the North London or University College Hospital, the medical school, and the boys' school, to the University of London, and to dissolve or provide for the dissolution of the college itself. The Bill will contain a clause authorising and providing for the making by the Senate of the university, or by such other body or persons as the Act may prescribe, of statutes and regulations for the management of the college; and provision will also be made for carrying on the work of the hospital, the medical school, and the boys' school.

THE new buildings of the Borough Polytechnic Institute were opened by Mr. Benn, chairman of the London County Council, on November 16. The buildings, which were urgently needed for the large number of students, have cost with equipment more than 24,000*l.* Toward this amount the central governing body of the City of London Parochial Charities contributed 3000*l.*, the London County Council 16,000*l.*, with a promise of a further sum. The council also meets the cost of installation of the electric light and equipment, amounting to 2950*l.* The total cost of the land, about 1½ acres, buildings and equipment, by the end of the year will be not less than 96,000*l.*

WITH the object of giving to the school children of the United Kingdom better knowledge of the colonies, and of giving to the school children of each colony better know-

ledge of the United Kingdom and of other parts of the Empire, a syllabus of seven lectures on the United Kingdom, each to be illustrated by about forty lantern slides, has been drawn up by a committee connected with the Colonial Office. The subjects of the lectures are:—(1) the journey from the East to London; (2) London the Imperial city; (3) scenery of the United Kingdom; (4) historic centres and their influence on national life; (5) country life and the smaller towns; (6) great towns, the industries, and commerce; (7) defences of the Empire. Mr. H. J. Mackinder will give an account of the scheme, and exhibit some of the slides which have been prepared to illustrate it, at the Whitehall Rooms, Hôtel Métropole, on Wednesday, December 7, at 5 p.m. The Colonial Secretary has consented to preside.

At the inaugural meeting of the new session of the Royal Statistical Society on November 15, the new president, Sir Francis Sharp Powell, Bart., M.P., delivered an address on education in which he presented specially impressive figures to illustrate prominent educational features of various countries. The activity in educational matters of to-day was commended, and attention directed to the growing conviction that a more liberal education than that provided by purely technical instruction is necessary in this country. Among other interesting comparisons instituted in the address was one dealing with the average expenditure on education per child in Prussia and in England. Exclusive of central and local administration, it appears that the average expenditure per child on the register is in Prussia 1*l.* 15*s.* 6*d.* if buildings are included, and 1*l.* 10*s.* 8*d.* exclusive of buildings. The corresponding figures in England are 2*l.* 12*s.* 9*d.* and 1*l.* 17*s.* Further, the number of scholars per teacher is 66 in Prussia and 57 in England, excluding pupil teachers. It seems clear from these figures that Germany, with a smaller expenditure per child than our own, succeeds in securing better results, and it is to be hoped that English education soon may be conducted more scientifically, so that the value of our education may be more in accordance with our expenditure. The address also pointed out that in secondary education German activity is shown in the provision of technical schools for special branches of metal industries, for wood-working, engineering, and textile industries, and for agriculture.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 16.—"Hydrolysis of Cane Sugar by *d*- and *l*-Camphor- β -Sulphonic Acids." By R. J. Caldwell, B.Sc.

The rates of inversion of cane sugar by two stereoisomeric acids were determined in order to compare the results with the case of inversion by enzymes, which are apparently all asymmetric substances. Wilhelmj's law holds accurately for half normal solutions of both dextro- and lævo-camphor- β -sulphonic acids. The velocity constant κ (equal to $10^4/t \log_{10} a/a-x$, where a is the initial cane sugar concentration, and x the concentration of the inverted sugar at the end of t minutes) was found to be 10.07 and 10.13 in two experiments with the dextro-acid, and 10.05 and 10.08 for the lævo-acid. The author concludes that there is no difference in the inverting power of the two acids attributable to their asymmetric structure. This result is in accord with the conclusion arrived at by Emil Fischer regarding the *d*- and *l*-camphoric acids (*Zeits. Physiol. Chem.*, 1898, vol. xxvi. p. 83). The relative activities of hydrochloric acid and camphor- β -sulphonic acid towards cane sugar are 100:90, whereas for milk sugar the ratio is 100:70.

November 17.—"Enhanced Lines of Titanium, Iron, and Chromium in the Fraunhofer Spectrum." By Sir J. Norman Lockyer, K.C.B., LL.D., F.R.S., and F. E. Baxandall, A.R.C.S.

In this paper the authors give the results of a detailed study of the enhanced lines of Ti, Fe, and Cr in relation to the lines of the Fraunhofer spectrum. In previous Kensington publications it had been shown that the enhanced lines of some of the metals are prominent in the spectra of α Cygni and the sun's chromosphere, whilst it has been generally recognised that the lines in the Fraunhofer spectrum are mainly the equivalents of lines in the arc spectra

of metals. In connection with the work on enhanced lines, it has been noted that some of them, at least, appear to correspond with comparatively weak solar lines to which Rowland has attached no origin. With the object of possibly tracing some of the unoriginated solar lines to their source, a careful comparison has been made between the enhanced lines shown in the photographic spark spectra of Ti, Fe, and Cr and the solar lines. The photographs used for this purpose were all taken with a Rowland grating, and on such a scale that the length of spectrum between K and F is about 14 inches (35 cm.). The chemical elements named were first selected for investigation because they furnish by far the greater number of enhanced lines which have been shown to occur in the spectrum of a Cygni.

It was found that many of the enhanced lines fell exactly on isolated lines of the solar spectrum, and in these cases the solar wave-lengths were adopted and the identification considered established. If, however, for any of these solar lines Rowland had given alternative origins, special comparisons were made of the enhanced line photograph with those of the metals given by Rowland. Notes (given at the end of the tables) were made as to the agreement or non-agreement of the metallic lines involved, and also of the relative intensities in their individual spectra, so that due weights could be given to the respective metallic lines which were thought conjointly to produce compound solar lines.

Where there was any doubt as to the exact coincidence of a metallic and solar line, or where by the close grouping of several solar lines it was not possible to say by direct comparison to which solar line the metallic line corresponded, careful measures were made of the metallic line, and its wave-length found by interpolation between closely adjacent lines of known wave-length. The resulting wave-lengths were then compared with Rowland's solar wave-lengths, and in cases of close agreement with solar lines it was deemed probable that the two lines were really identical.

A final table is given of the enhanced lines of the three elements which are considered, as a result of the analysis, to be identical with lines in the Fraunhofer spectrum. Forty-two of these agree with solar lines unoriginated by Rowland, and as the majority of them are conspicuous lines in stellar spectra of certain types, it has been thought that these results will be of importance in standardising the wave-lengths of many stellar lines.

Physical Society, November 11.—Dr. R. T. Glazebrook, F.R.S., president, in the chair.—Investigation of the variations of magnetic hysteresis with frequency: Prof. T. R. Lyle. The experiments were made on two rings of laminated annealed iron, in one of which the radial breadth of the iron was considerable relative to its mean radius. These rings were magnetised by alternating currents of different strengths and periods; both the magnetising-current wave and the magnetic-flux wave were quantitatively determined by a wave-tracer (described by the author in the *Phil. Mag.*, November, 1903), and the wave-forms so obtained subjected to harmonic analysis. The experiments were divided into series, in which the period and wave-form of the magnetising current were kept as nearly constant as possible throughout any one series, while its strength was varied. The analytic expressions for the associated current and flux waves for a few series are given in tabular form. From the analytic expressions for each pair of associated waves it was found that when the magnetising current was approximately sinusoidal the total iron loss (I) was, within certain limits of the induction, given by a formula $I = (a + bn)B^{1.57}$, where n is the number of periods per sec., B the "effective induction," and a and b are constants. When from the total iron loss per c.c. per cycle the sum of the static hysteresis and the value that theory assigns to eddy-current loss was subtracted, a considerable quantity remained, which increased both when the frequency and the flux-density increased. This quantity, called by Fleming the kinetic hysteresis, has been obtained for each experiment.—On the practical determination of the mean spherical candle-power of incandescent and arc lamps: G. B. Dyke. Mr. Dyke points out the need of an improved method of expressing the efficiency of glow-lamps, and adopts the suggestion of Dr. Fleming of expressing the whole flux of light in lumens per watt. The expression of

the efficiency in this manner involves the determination of the mean spherical candle-power (M.S.C.P.), and the paper describes a method of doing this. The objects of the paper are:—(1) to obtain curves showing the variations of candle-power of glow-lamps in a horizontal plane; (2) to obtain reduction factors by which the mean horizontal candle-power (M.H.C.P.) may be calculated from the maximum horizontal candle-power (C.P.); and (3) to obtain reduction factors for deducing the M.S.C.P. from the M.H.C.P. and from the C.P.—Exhibition of apparatus: R. W. Paul. The construction of highly sensitive pivoted electrical instruments has been rendered difficult by the fact that delicate pivots will not admit of transporting without injury. A number of galvanometers were shown in which the design was based upon the use of a moving coil, supported on one pivot in a powerful and uniform magnetic field, and controlled by a spring. A simple non-reflecting, suspended-coil galvanometer for the student's use, with a sensibility of 1 division per micro-ampere, was also exhibited. A new design of lantern, adapted for science lectures, and for use with three Nernst filaments arranged closely together, was shown in action. It is capable of being instantly changed from horizontal to vertical projection, can be fitted with a reversing prism, and has a wide adjustment for focusing. Another exhibit was an Ayrton Mather reflecting electrostatic voltmeter with a magnetic damping device. The instrument shown had a sensibility of 500 mm. at 1 m. for 30 volts, but similar instruments are made to give this deflection with pressures as low as 8 volts.

PARIS.

Academy of Sciences, November 14.—M. Mascart in the chair.—Researches on the desiccation of plants: the period of vitality. Moistening by liquid water: imperfect reversibility: M. Berthelot.—New researches on the Cañon Diablo meteorite: Henri Moissan. A very careful and complete examination was made of a block of this meteorite weighing 183 kilograms. It was found to be distinctly heterogeneous in structure, containing iron, nickel, sulphur, phosphorus, silicon, and carbon. The latter element was present in several forms: amorphous carbon, graphite, and diamonds, both the black and transparent variety of the diamond being separated. Characteristic green hexagonal crystals of silicon carbide were also isolated, the author remarking that this is the first time that this compound has been met with in nature.—The measurements of the velocity of propagation of earthquakes: G. Lippmann. An instrument is described capable of determining to $1/5$ of a second the exact time of the commencement of a seismic shock at any given point. The author also discusses the following problem: to find the direction of the seismic wave front at the surface of the earth, in a given region, and to measure the velocity of its horizontal propagation.—On the inscription of seismic movements: G. Lippmann. In the photographic self-recording apparatus in common use for earthquake phenomena, owing to the considerable expense of the strip of sensitised paper, its velocity through the apparatus is very slow, about 12 cm. per hour. In the modification now proposed, the slit through which the ray of light falls on the paper is closed by a shutter, and this is operated electrically by the seismic shock. By this means the speed may be greatly increased, since the paper is only used up during the period of the earthquake shocks.—On the seeds of the Neuropteridæ: M. Grand'Eury. As the result of the examination of more than 1000 specimens of fossil seeds, usually attributed to ferns, the author distinguishes 15 genera or subgenera of Neuropteridæ, and 25 specific types.—Remarks on Hugoniot's adiabatic law: M. Jouguet.—On the use of helium as a thermometric substance and on its diffusion through silica: Adrien Jaquerod and F. Louis Perrot. An attempt to determine the melting point of gold with a thermometer of fused silica, and containing helium, failed owing to the rapid diffusion of the gas through the silica at the high temperature. The velocity of diffusion appears to be proportional to the pressure of the gas, and is very considerable, since after six hours' heating at 1100° C. the pressure of the helium had fallen to about one-seventh of the initial pressure. Below a red heat, at about 510° C., the diffusion is still fairly rapid, and a very slow effect could even be traced at 220° C. For practical purposes, therefore, the nitrogen

thermometer remains the best instrument for high temperatures.—Researches on dielectric solids: V. **Crémieu** and L. **Malcles**. In the course of his researches on electric convection, Crémieu observed some anomalies of electrical influence through solid dielectrics. The authors have commenced a systematic study of these phenomena, and give an account in the present paper of the apparatus used, reversing the results for a future communication.—On the conductivity of gases from a flame: Paul **Langevin** and Eugène **Bloch**. The coefficient of re-combination of the ions from a flame has been measured, and found to be equal to about 0.7. This value is less than one, as the theory requires, and is much greater than in the case of the Röntgen rays.—On the absorption of hydrogen by rhodium: L. **Quennessen**. Contrary to the statement given in the text-books, the absorptive power of rhodium for hydrogen is nil. Rhodium is not analogous with palladium in this respect.—The action of boric acid on the alkaline peroxides and the formation of perborates: George F. **Jaubert**. By the action of boric acid upon sodium peroxide a perborate of sodium is formed, the analysis of which leads to the composition $\text{Na}_2\text{B}_2\text{O}_5 \cdot 10\text{H}_2\text{O}$. On re-crystallising this a substance possessing more oxygen, $\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$, is formed, and this is very stable at the ordinary temperature, although decomposed rapidly at 100°C . The latter substance, treated with 50 per cent. sulphuric acid, gives after filtration through guncotton a solution of hydrogen peroxide of a strength of 150 to 200 volumes.—On thioformic acid: V. **Auger**. The author has shown in a previous paper that the substance regarded by Wöhler and Limpricht as thioformic acid is in reality trithioformaldehyde. The method which was found to give the best yield of sodium thioformate was the interaction of sodium hydrogen sulphide with phenyl formate. The latter substance was incidentally obtained in the pure state for the first time, and details of its preparation are given.—The synthesis of $\beta\beta$ -dimethyl-adipic acid: G. **Blanc**.—On a new sugar from the berries of the mountain ash: Gabriel **Bertrand**. The sugar is isomeric with, but distinct from, sorbite and mannite, and is provisionally named sorberite. Its physical properties are given, and its composition as a hexahydric alcohol determined by the production of a hexacetate.—The development of the organic material in seeds during their ripening: G. **André**.—On the detection of cotton seed oil in olive oil: E. **Milliau**. The test proposed is a modification of the reduction test with silver nitrate.—Anhydrobiosis and tropisms: Georges **Bohn**.—On the growth of man and of living beings in general: Charles **Henry** and Louis **Bastien**.—The evolution of the weight and organic material of the leaf during necrobiosis in white light: L. **Beulaygue**.—On heterogeneity in the Stichodactylina group: Armand **Krempf**.—The comparative influence of some organic compounds of phosphorus on the nutrition and development of animals: A. **Desgrez** and A. **Zaki**.—On the inoculation of cancer: M. **Mayet**.—On the bleaching of flour by electricity: M. **Balland**. The treatment of flour by electrified air has a bleaching action, and produces chemical changes corresponding to the effect of age.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 24.

ROYAL SOCIETY, at 4.30.—On the Refractive Indices of the Elements: C. Cuthbertson.—The Flow of Water through Pipes. Experiments on Stream-line Motion and the Measurement of Critical Velocity: Drs. H. T. Barnes and E. G. Coker.—On Galvanic Cells produced by the Action of Light. Preliminary Communication: Dr. M. Wilderman.—Some Physical Characters of the Sodium Borates, with a New and Rapid Method for the Determination of Melting Points: C. H. Burgess and A. Holt, jun.—On the Convergence of Infinite Series of Analytic Functions: H. A. Webb.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Hydrodynamical and Electromagnetic Investigations regarding the Magnetic-Flux Distribution in Toothed-Core Armatures: Prof. H. S. Hele-Shaw, F.R.S., Dr. Alfred Hay, and P. H. Powell.

FRIDAY, NOVEMBER 25.

PHYSICAL SOCIETY, at 5.—The Measurement of Small Differences of Phase: Dr. W. E. Sumpner.—On the Curvature-method of Teaching Geometrical Optics: Dr. C. V. Drysdale.—(1) Exhibition of Specimens of Crystals showing the Phenomenon of Luminous Rings; (2) On a Rapid Method of Approximate Harmonic Analysis: Prof. Silvanus P. Thompson.—Exhibition of Apparatus by Prof. Dalby, Mr. Darling, Dr. Drysdale, and Prof. Thompson.

SATURDAY, NOVEMBER 26.

ESSEX FIELD CLUB (at Essex Museum, Stratford), at 6.30.—Delegate's Report British Association: F. W. Rudler.—Notes on Supposed Lake Settlement at Skitt's Hill, Braintree: F. W. Reader.—Coast Erosion in East Anglia: John Spiller.

MONDAY, NOVEMBER 28.

SOCIETY OF ARTS, at 8.—Musical Wind Instruments: David J. Blaikley (Cantor Lecture I.).
INSTITUTE OF ACTUARIES, at 5.—Inaugural Address by the President, Mr. Henry Cockburn.

TUESDAY, NOVEMBER 29.

ZOOLOGICAL SOCIETY, at 8.30.—Some Observations on the Field Natural History of the Lion: Capt. Richard Crawshaw.—On some Nudibranchs from East Africa and Zanzibar. Part VI.: Sir Charles Eliot, K.C.M.G.—The Altai Lynx: R. Lydekker, F.R.S.—On Old Pictures of Giraffes and Zebras: R. Lydekker, F.R.S.—On the Morphology and Classification of the Asellota Group of Crustaceans, with Descriptions of the Genus *Stenetrium* and its Species: Dr. H. J. Hansen.—On the *Lacerta depressa* of Camerano: G. A. Boulenger, F.R.S.
INSTITUTION OF CIVIL ENGINEERS, at 8.—Discussion: Distribution of Electrical Energy: J. F. C. Snell.

WEDNESDAY, NOVEMBER 30.

SOCIETY OF ARTS, at 8.—The British Canals Problem: Arthur Lee.

THURSDAY, DECEMBER 1.

ROYAL SOCIETY, at 4.30.—*Probable Papers*:—The Ascent of Water in Trees: Dr. A. J. Ewart.—On the Presence of Tyrosinases in the Skins of some Pigmented Vertebrates. Preliminary Note: Miss F. M. Durham.—On Chemical Combination and Toxic Action as Exemplified in Hæmolytic Sera: Prof. R. Muir and C. H. Browning.—Histological Studies on Cerebral Localisation. Part II.: Dr. A. W. Campbell.
CHEMICAL SOCIETY, at 8.—The Nitrites of the Alkali Metals and Metals of the Alkaline Earths, and their Decomposition by Heat: P. C. Ray.
RÖNTGEN SOCIETY, at 8.15.
LINNEAN SOCIETY, at 8.—Proteid Digestion in Animals and Plants: Prof. Sidney H. Vines, F.R.S.

FRIDAY, DECEMBER 2.

AERONAUTICAL SOCIETY, at 8.—The Aeronautical Exhibits at the St. Louis Exhibition: the President, Major B. Baden-Powell.—Kites, Kite-flying and Aeroplanes: W. H. Dines.—The Work of the International Aeronautical Commission: Dr. M. H. Hergesell.—Captive Balloon Photography: Griffith Brewer.

CONTENTS.

PAGE

Naturdenkmäler	73
Principles of Fuel Combustion. By J. S. S. B.	74
School Mathematics	75
Our Book Shelf:—	
Schneider: "Handbuch der Laubholzkunde."—Prof. Percy Groom	76
Bell: "The Cancer Problem in a Nutshell."—R. T. H.	76
"Photography on Tour"	76
Austin: "The Story without an End"	76
Letters to the Editor:—	
On the Origin of Flagellate Monads and of Fungus-germs from Minute Masses of Zoogloea.—(Illustrated.)—Dr. H. Charlton Bastian, F.R.S.	77
The Temperature of Meteorites.—H. E. Wimperis	81
Mount Everest: the Story of a Controversy.—Douglas W. Freshfield	82
Observations of the Leonid Meteors of 1904.—W. H. Milligan	83
The Discovery of Argon.—Prof. G. H. Darwin, F.R.S.	83
Blue-stained Flints.—Dr. F. J. Allen	83
Inheritance of Acquired Characteristics.—D. E. Hutchins	83
Dr. Koenig's Method of Colour Photography	83
The New Whale Fisheries. (Illustrated.) By D. W. T. Notes	85
Our Astronomical Column:—	
Encke's Comet (1904 <i>b</i>)	89
Observations of Perseids	89
Heights of Meteors	89
The Photographic Spectrum of Jupiter	89
Science and the State. By Sir William Abney, K.C.B., F.R.S.	90
The Ben Bulbin District. (Illustrated.)	91
Coast Erosion and Protection	92
The November Meteors of 1904. By W. F. Denning	93
University and Educational Intelligence	94
Societies and Academies	94
Diary of Societies	96